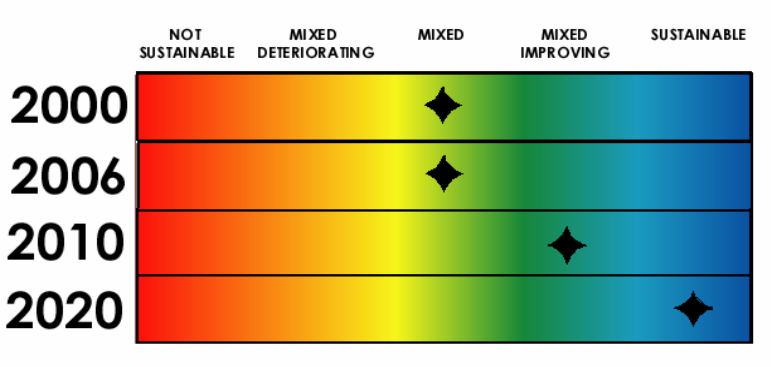
Subgoal 11

Do we have enough information, data, understanding, and indicators to inform the decision-making process?

Status

Positive movement was achieved by not only the collaborative FY 2005 intensive monitoring, but also the attention to the issue as one of the Great Lakes Regional Collaboration issues.

Lake Michigan Target Dates for Sustainability



Indicators (Proposed New State of the Lakes Ecosystem Indicators)

- Access to Information about the Great Lakes
- Research/Educational Opportunities

Challenges

- To expand Lake Michigan basin monitoring collaboration and coordination by promoting data comparability and joint planning and to deliver efficient and timely reporting on the status of the Lake Michigan ecosystem
- To leverage the 1994-95 Lake Michigan Mass Balance sampling with a 2005 Lake Michigan intensive and coordinated effort and combine with GLNPO's 2005 Aquatic Contaminant Monitoring:
  - Determine trends from comparison of 1995 Lake Michigan Mass Balance and FY 2005 Intensive year and GLNPO FY 2005 monitoring and follow up management actions and tentatively report preliminary findings in LaMP 2008 and to the State of Lake Michigan Conference in 2009
  - Sponsor cladophora monitoring and research

Next Steps

- Monitoring and research will be reviewed to identify LaMP pollutants and trends to determine if LaMP pollutants list needs to be changed
- A LMMB Study data report completed for each contaminant studied and added to the LaMP online at www.epa.gov/GLNPO/LMMB
- Progress will be made in aligning monitoring programs and indicators
- The coordinated monitoring results for the lake intensive monitoring year 2005 will be completed, analyzed, and published
- Lake Michigan models will be documented further, and additional scenarios will be simulated with results shared through the LaMP and in other ways
- Complete Lake Michigan Monitoring Coordinating Council Aquatic Nuisance Species monitoring survey results and recommendations.
- Cladophora alga research and development is being supported by the LaMP

Background

LaMP collaborators identified the need for coordinated collaboration in 1998 and sponsored a lake basin monitoring inventory and the formation of the Lake Michigan Monitoring Coordinating Council (LMMCC). The LMMCC enabled the 2005 Intensive Year of Monitoring as follow up to the 1995 Lake Michigan Mass Balance Monitoring. In 2005, the LaMP Technical Committees also conducted a review of the State of the Lakes Ecosystem Conference indicators to determine the appropriateness for Lake Michigan and to identify any gaps (see Chapter 4 and Chapter 7).
Work on these issues are in alignment with reviews at the national level conducted by the President's U.S. Commission on Ocean Policy and the Great Lakes Regional Collaboration (GLRC) Strategy Report on indicators and monitoring (www.glrc.us). Highlights and excerpts follow.

The U.S. Commission on Ocean Policy (www.oceancommission.gov) highlighted the need for "unbiased, credible and up to-date scientific information" to properly manage the human activities that effect the nation's oceans coasts and Great Lakes. The Commission, which presented its findings in 2004, found that new scientific findings demonstrate the complexity and interconnectedness of natural systems and that management approaches have not been updated to reflect this complexity with responsibilities remaining dispersed among a confusing array of agencies at the federal, state, and local levels. Managers, decision makers, and the public require timely access to reliable data and solid scientific information that have been translated into meaningful products. The Commission urged Congress to double the federal research budget over the next five years and to fund and adopt an integrated observing system on a regional basis.

The GLRC found that the volume of data collected for the Great Lakes and their tributary watersheds has expanded considerably in recent years, coinciding with an increase in the complexity of issues that need to be addressed. The current lack of accessible, integrated information management systems limits decision-making abilities and application of adaptive management principles for the protection and restoration of ecological resources. Adaptive management requires one to identify priority issues, gather information, establish metrics, evaluate options, implement actions, track progress, reevaluate actions based on observed responses, communicate results and adjust both management approaches and monitoring activities. Although such capabilities are advancing within the Great Lakes basin, they exist only in piecemeal fashion and have not been fully integrated for the comprehensive management of the Lakes. To further complicate matters, decisions made on one issue often affect other issues. Observing systems, monitoring programs, indicators, research, modeling and analysis, information management and communication must therefore be integrated into a holistic decision-making process.

- **Observing systems**, including sensors, stations, networks and field data collection are the primary means for gathering information on the chemical, biological and physical characteristics of the Great Lakes ecosystem.
- **Monitoring Programs** use these observations to take the pulse of the Great Lakes, assess natural

Great Lakes Regional Collaboration Action Items

Information and Indicators

With a resource as large and complex as the Great Lakes ecosystem, it is essential to have a **sound information base and representative indicators** to understand what is happening in the system. This information must then be communicated to the public, to decision makers, and all others involved. To improve over the current situation, the following actions are needed:

- better coordinate the collection of critical information regarding the Great Lakes ecosystem and support the U.S. Integrated Earth Observation System (IEOS) and the Integrated
- Ocean Observing System (IOOS) as key components of the Global Earth Observation System of Systems (GEOSS);
- promote the continued development of science-based indicators, including those developed through the SOLEC process;
- double funding for Great Lakes research over the next five years;
- establish a regional information management infrastructure; and
- create a Great Lakes communications workgroup to manage scientific and technical information.

The Lake Michigan Toolbox
Lake Michigan Online GIS

Lake Michigan Online Atlas

The Lake Michigan Online Atlas provides Internet access to a number of information resources related to the Lake Michigan basin. Reference maps offer an overview of the region. Computer-compatible data layers can be downloaded for use in a geographic information system (GIS). Hyperlinks and contact information improve access to regional resources. And an online mapping tool allows internet users to explore data and create custom maps using a web browser.

More information is available at http://mapserver.glc.org/website/atlas/viewer.htm.

Great Lakes Fishery Commission GIS

The Great Lakes Fishery Commission is developing an aquatic atlas in GIS format that pulls together data from the Lake Michigan Mass Balance studies, historical sediment surveys, coastal wetland data as well as dam databases to facilitate a holistic approach to managing the Great Lakes basin. These layers of aquatic habitat information will compliment the current on-line atlas work of the Great Lakes Commission.

More information is available at www.glfc.org/glgis.

Openlands and Center for Neighborhood Technology

Openlands and the Center for Neighborhood (CNT) technology are updating a website that details the green infrastructure for the greater Chicago region. In the first phase of the project, Openlands and CNT collected 170 layers of valuable data on wetlands, floodplains, rivers, protected open space, threatened and endangered species, greenways, trails and soils. The website has been utilized as a planning tool for creating linkages between existing protected lands and for identifying opportunities for natural resource protection and restoration. Phase II will improve the existing website with new and updated information and expand the project's geographic reach by adding data layers for 5 new counties. Upon completion of Phase II, the website will be interactive and allow users to create customized maps of specific geographic areas with the data layers which are most significant to them.

More information is available at: www.greenmapping.org.

variability, drive ecosystem forecasting models, and assess the progress of restorations efforts. Current challenges facing observing and monitoring include: incomplete inventories of federal, state/provincial and municipal observation and monitoring activities; insufficient spatial density of basic observations across the system; incomplete coverage over varying time scales (real-time to historic).

- **Goals or end point examples** were developed by the Great Lakes governors and adopted by the GLRC. The LaMP goals were set through a stakeholder process in 1998 and adopted by the LaMP management committee (See page i-2 for LaMP goals).
- **Indicators** provide information on the state of the Great Lakes and progress toward achieving goals. Continued efforts are needed to ensure the viability of an informative and scientifically-based set of indicators (e.g., the State of the Lakes Ecosystem Conference (SOLEC) indicator suite) that are useful for management decisions and to inform the public. The SOLEC indicator suite has been refined over the last decade to be comprehensive yet practical and actionable. In addition, indicators should be used in relation to realistic "end points" or desired results that are accepted by most stakeholders. When identifying end points, stakeholders must recognize that variability is the norm in natural systems, therefore, many targets and goals should not be expressed as discrete numbers but rather as ranges of desired, natural levels (See LaMP 2000, Chapter 3). Research has traditionally been focused on single issues. This focus must transition to an ecosystem approach with greater emphasis on predictive

forecasting and adaptive management. Research should be directed towards improving the understanding of natural fluctuations and interactions of ecosystem components. Improvements in predictive capabilities are needed, particularly regarding the impacts of chemical, biological and physical changes on ecosystem structure and function. Development of such capabilities requires a comprehensive research coordination strategy across partnering institutions.

- **Information produced by research and observations** must be made readily available to managers, decision-makers and the public. This will require information integration, management and communication. The LaMP sponsors the Lake Michigan Forum's State of the Lake Michigan Conference every two years, the LMMCC work and the LaMP document itself to inform managers and the public of current status and trends.

Various methods are used to communicate information to those that require it, but coordination needs strengthening for the sheer breadth of information collected over the region. The lack of a coordinated message can make it difficult for audience groups to interpret and understand information. The audiences that require information are also diverse, requiring that complex information needs to be sufficiently repackaged to meet their needs. Some information, such as lake conditions and beach closings, requires rapid delivery. In addition, two-way communication needs to be promoted so that user needs are conveyed back to those producing the information. A comprehensive, two-way communication strategy has not been developed to address these needs.

Lake Michigan Monitoring Coordinating Council

The Lake Michigan Monitoring Coordinating Council was established to enhance coordination, communication, and data management among agencies and other organizations that conduct or benefit from monitoring efforts in the Lake Michigan basin in the interest of supporting the Lake Michigan LaMP.

The Council has members representing federal, state, tribal, and local governments, nonprofit watershed groups, and other environmental organizations, educational entities, and the regulated community. The Council meets twice each year in locations throughout the watershed. Council meetings, biennial conferences, and feedback from constituents shape the Council's work plan and activities.

The Council framework has been developed to increase coordination between appropriate monitoring entities, allow the development of a strategic plan for monitoring, and add value to the individual efforts of the Council's member organizations. The framework takes advantage of the logical interactions between the various resource-based monitoring entities and other affected stakeholder groups.

The working groups formed under this framework will build on the efforts to coordinate monitoring within individual resources by groups such as the Lakewide Management Plan Committees, the Wisconsin Groundwater Coordinating Council, and the Great Lakes Fishery Commission. Each of these resource-based working groups will coordinate existing monitoring networks around several common considerations: monitoring objectives; spatial, temporal and parameter network design; methods comparability; quality assurance and control planning; database sharing; and data analysis approaches.

More information is available at http://wi.water.usgs.gov/lmmcc/.

GLNPO's Aquatic Contaminant Monitoring Program—FY 05 Intensive Year

GLNPO is responsible for monitoring the water quality of the Great Lakes. GLNPO has been collecting data on levels of persistent bioaccumulative toxic (PBT) substances in air and fish since 1990 and the 1970s, respectively. Many PBTs have the potential to increase the risk of cancer, birth defects, and neurological and developmental problems through long-term, low-level exposure. These pollutants can enter the Lakes in significant quantities from the air and subsequently build up in fish, which results in limits on consumption of Great Lakes fish. Data complementary to the air and fish data is needed for the water so that USEPA can accurately estimate the net amount of these pollutants that are being put into the lakes from the air and to determine how high levels are in fish relative to the levels in the water. Levels in fish can be millions of times higher than in the water itself. USEPA monitored these contaminants in the past and in 2005 again for Lake Michigan.

The following chemicals will be monitored:

- Polychlorinated biphenyls (PCBs)
- Polycyclic Aromatic Hydrocarbons (PAHs)

USGS Surface Water-Quality Network for Streams in the Lake Michigan Basin

A recent inventory and assessment of existing monitoring programs was undertaken by the Great Lakes Commission (Great Lakes Commission, 2000) as an effort to identify data sources and gaps, the adequacy of the data to support critical ecosystem indicators, and to provide recommendations for addressing major monitoring needs, particularly those considered most important for addressing lakewide management decision-making. Report findings suggest that the data inventory should be expanded to include all Lake Michigan tributaries, and emphasizes the need to coordinate monitoring efforts.

To begin addressing some of these issues, the USGS retrieved surface water-quality and flow data and analyzed it from current and historic databases to identify candidate stations for inclusion in a long-term monitoring network in the Lake Michigan basin.

The inventory was compiled from the USGS National Water Quality Information System (NWIS) database, the USEPA STOrage and RETrieval (STORET) database, and the Indiana Department of Environmental Management (IDEM) database (AIMS) for the period from 1970 through 2001. These databases include water-quality data collected by numerous Federal and State agencies including the USGS, USEPA, US Forest Service (USFS), US Army Corp of Engineers (USACE), National Park Service (NPS), Wisconsin Department of Natural Resources (WDNR), Michigan Department of Environmental Quality (MDEQ), IL Environmental Protection Agency (IEPA), and IDEM.

The majority of samples included in this inventory were collected at a site during a single sample year (purple dots on Figure 11-1), however, there is a reasonably good spatial coverage of sites having from 2 to 5 years of data (yellow dots on Figure 11-2). A substantial number of sites in northern Indiana have greater than 5 years of data, as do various sites scattered throughout the Basin in Wisconsin and Michigan, however, flow data was not collected at many of these sites.

As a refinement of the inventoried data, sites with more than 5 years of water-quality data collection and including flow data are illustrated on Figure 11-2. Sites are depicted with years of sampling, numbers of samples collected, and whether or not a site is still active.

For additional information contact: Charlie Peters, Director, USGS Wisconsin Water Science Center, capeters@usgs.gov.

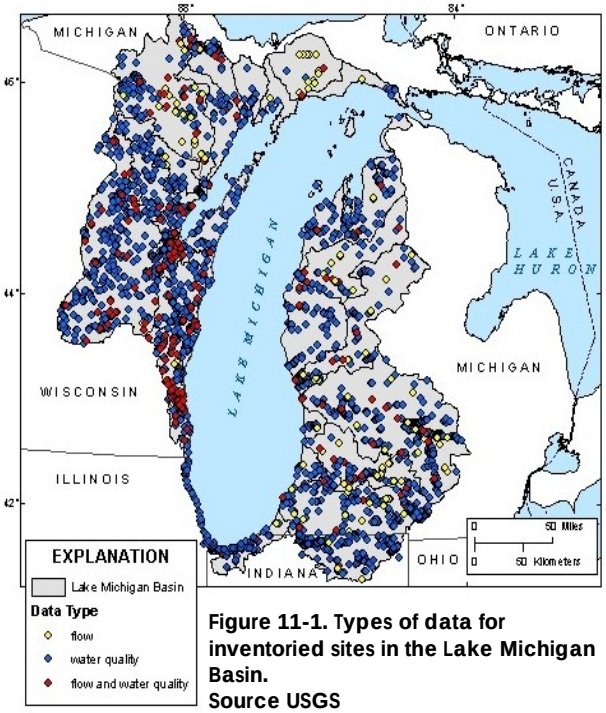


Figure 11-1. Types of data for inventoried sites in the Lake Michigan Basin.
Source USGS

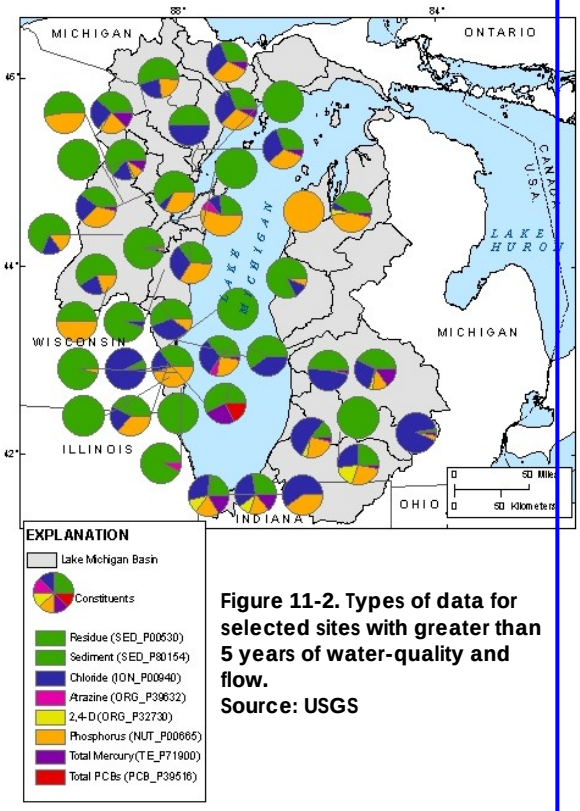


Figure 11-2. Types of data for selected sites with greater than 5 years of water-quality and flow.
Source: USGS

From information compiled by Dave Hall, Jana Stewart, and Krista Stensvold of USGS Wisconsin Water Science Center.

Great Lakes Coastal Wetlands Consortium

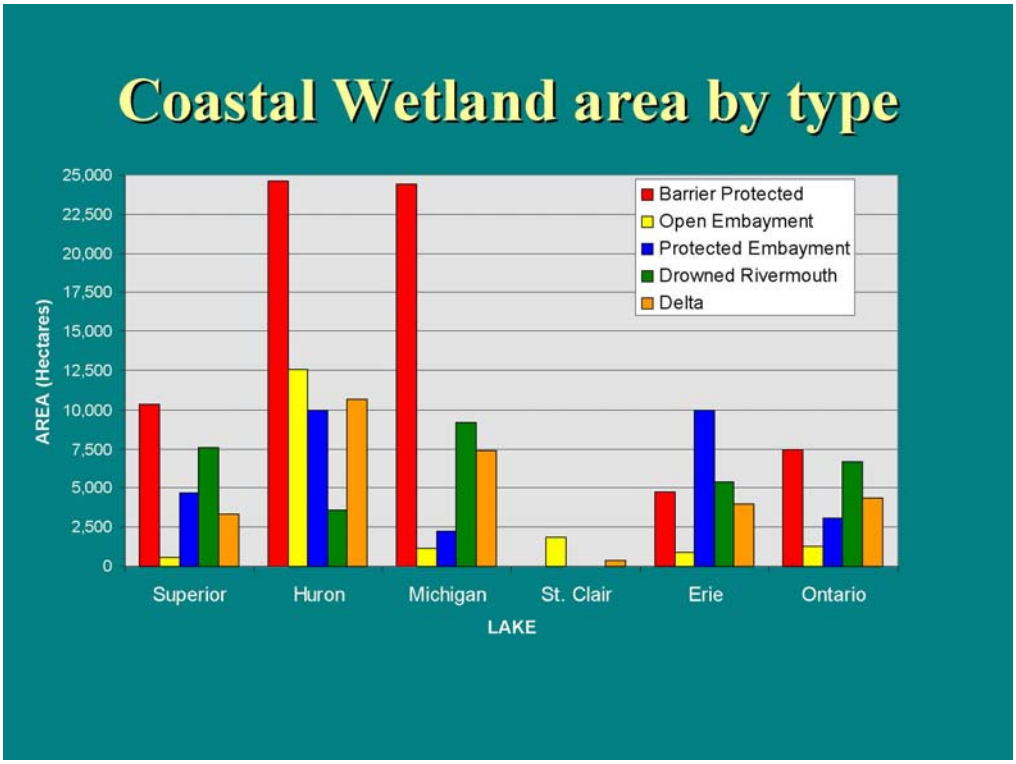
The Great Lakes Coastal Wetlands Consortium is premised on the recognized need to assess the health of Great Lakes coastal wetlands, which are an integral part of the Great Lakes basin ecosystem. Coastal wetlands have critically important ecological values and functions, yet there are currently few basinwide data available for assessing their ecological health.

The Great Lakes Commission has convened the Great Lakes Coastal Wetlands Consortium to expand the monitoring and reporting capabilities of the U.S. and Canada under the Great Lakes Water Quality Agreement.

The Great Lakes Coastal Wetlands Consortium consists of scientific and policy experts drawn from key U.S. and Canadian federal agencies, state and provincial agencies, non-governmental organizations, and other interest groups with responsibility for coastal wetlands monitoring. Approximately two dozen agencies, organizations and institutions have been brought into the Consortium as Project Management Team members. This is an unprecedented assembly of coastal wetlands expertise. In addition, other members are brought in as small project teams are formed to address discrete project elements and pilot studies. The Consortium is coordinated by staff at the Great Lakes Commission (GLC) in Ann Arbor, Michigan and has been funded by the USEPA Great Lakes National Program Office in Chicago, Illinois.

The Consortium's purpose is to design an implementable, long-term program to monitor Great Lakes coastal wetlands. This is being accomplished through the development of indicators to assess the condition of Great Lakes coastal wetlands. The selected indicators were selected through the State of the Lake Ecosystem Conference (SOLEC) process. The Consortium will provide scientific support for this monitoring program; create a database that is publicly accessible; recruit the leadership required to implement the long-term monitoring program; and develop a network of funders and agencies who will support the Great Lakes coastal wetlands monitoring program.

More information is available at: www.glc.org/wetlands/



Source: "Status of Great Lakes Coastal Wetlands" presentation, Thomas Burton, Michigan State University and Joel Ingram, Environment Canada, http://www.glc.org/wetlands/documents/Coastal-Wetlands-plenary.pdf

GLNPO Water Quality Surveys

The USEPA Great Lakes National Program Office's water quality surveys generally focus on the offshore waters of the lakes (water greater than 30 meters in depth, or greater than 3 miles from shore). To ensure that sampling activities are representative of lake conditions, samples are collected from multiple sites within each lake basin. The number and locations of the sites needed to obtain a representative sampling of each basin was statistically determined using historical data collected during intensive surveys of each lake. Each basin consists of several routine monitoring stations and a "master station". The master stations generally represent the deepest area of the basin and are often used to collect supplementary data for other (non-survey) purposes. The spring surveys are designed to collect water quality information during unstratified (isothermal) conditions of the lake, and the summer surveys are designed to monitor the Lakes during stratified conditions. As a result, the number of depths sampled during the summer is greater than the number of depths sampled during the spring surveys.

The surveys provide data to detect and evaluate trends and annual changes in chloride, nitrate nitrogen, particulate nitrogen, silica, total phosphorus, total dissolved phosphorus, particulate phosphorus, chloride, and reactive silica.

The biology program monitors phytoplankton, zooplankton, benthic invertebrates, and chlorophyll a in the water column. Zooplankton and phytoplankton samples are collected twice per year, in spring and summer. The majority of benthos samples are collected in summer, although a small number of stations are visited in spring. Some benthos-only stations are located closer to shore.

Maps of sampling stations can be found at: www.epa.gov/glnpo/monitoring/guard/sampling_stations.html

- Organochlorine pesticides including DDT and toxaphene
- Dioxins and furans
- Mercury and methylmercury
- Polybrominated diphenyl ethers (PBDEs) (flame retardants used in materials and plastics)
- Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) (from a waterproofing product now off the market)

Great Lakes National Parks Monitoring

Two national parks in the Lake Michigan basin are participating in a Great Lakes Network made up of 9 national park units from four states in the Great Lakes region. At the southern end of the Lake, work is progressing on assessing the extent of invasive plant species in interdunal wetlands of the Indiana Dunes National Lakeshore and State Parks. These special wetlands are highly vulnerable to invasives such as purple loosestrife and Phragmites. Park staffs are working with The Nature Conservancy, Save the Dunes Council, and Shirley Heinze Trust Fund to formulate a control program that will eliminate invasives and protect the native plant species.

The Sleeping Bear Dunes and the Indiana Dunes National Lakeshore are working as a unit for monitoring, fostering the exchange of information and resources between parks with similar issues, reducing per park costs through multi-park studies and providing network-based expertise that would not be affordable to the parks individually. The overall purpose is to develop broadly-based scientific data on current status and long-term trends in composition, structure, and function of the parks' ecosystems.

State of the Lakes Ecosystem Conference

Additional work has been completed on the Great Lakes indicators over the past 2 years through the State of the Lakes Ecosystem Conference (SOLEC) process. The SOLEC is hosted every two years by USEPA GLNPO and Environment Canada. The next conference will be held in Milwaukee, Wisconsin, in November 2006. The conferences are intended to provide a forum for exchange of information on the ecological condition of the Great Lakes and surrounding lands. A major goal is to bring together a large audience of government (at all levels), tribal, corporate, and not-for-profit managers to discuss problems that affect the lakes. The conferences have led to information gathering by a variety of agencies and organizations. In the year following each conference, a State of the Great Lakes Report is prepared by the governments based on the conference and public comments following the conference.

Lake Michigan Tributary Monitoring Project—FY 2005 Intensive Year

The Lake Michigan Tributary Monitoring Project, funded by the USEPA – Great Lakes National Program Office, was designed to yield updated water column contaminant concentration and loading data for a subset of the tributaries and contaminants originally included in the 1995 Lake Michigan Mass Balance (LMMB) project. It is not currently possible to revisit all Lake Michigan Mass Balance sampling sites with the same sample analyte and sample frequency schedules. In addition, funding in 2005-06 is even tighter than it was in 1994-1995. The challenge for this project was to design a less ambitious sampling plan that still yields useful information about tributary loadings throughout the Lake Michigan Basin 10 years after the 1995 LMMB. This project was coordinated and managed by the Great Lakes Commission in its role as the facilitator of the Lake Michigan Monitoring Coordinating Council.

There are four main objectives for this project:

1. Characterize present-day water column PCB, nutrient, and mercury concentrations at five of the original 11 Lake Michigan Mass Balance sampling sites.
2. Estimate mass loading for each of the five sampled Lake Michigan tributaries.
3. Estimate the uncertainty associated with each of the loading estimates.
4. Compare concentration and loading estimates with the 1994-1995 Lake Michigan Mass Balance project concentrations and loading estimates.

The original Lake Michigan Mass Balance water column sampling was designed to determine loads from each tributary with 95% confidence intervals of ± 25%. The sampling frequencies for this project were limited by budget, and can duplicate neither the sampling frequencies nor the confidence intervals associated with the load estimates that were part of the Lake Michigan Mass Balance project. Therefore, data analysis for this project will include the estimation of uncertainty in the load estimates.

Sampling on the Lower Fox River by Wisconsin U.SGS staff began in the first week of August, 2005. To date, five of 12 planned samples (plus a field duplicate and field blank) have been collected on the Lower Fox River. Wisconsin USGS staff will collect a 6th sample when ice conditions permit.

Sampling on the Indiana Ship Canal by Michigan USGS staff began in the last week of September, 2005. To date five of 12 planned samples have been collected at the Indiana Ship Canal. Michigan USGS staff collected a sixth sample plus a field replicate in early March 2006.

In addition, supplemental sampling at the St. Joseph, Grand, and Kalamazoo Rivers is complete. This supplemental sampling was designed to make intra-lab comparisons between conventional pollutant results reported by the Michigan Department of Environmental Quality and Wisconsin State Lab of Hygiene. The supplemental sampling involved obtaining split samples (for analysis at both MDEQ and WI SLOH) for nutrients and solids, for about four sample collection dates.

During 2005, a total of 92 samples were collected from 11 Lake Michigan tributaries. These tributaries (along with the number of samples from each), include the Grand (12); Kalamazoo (12) ; Muskegon (12); Escanaba (12); Pere Marquette (12); St. Joseph (12); Boardman (4); Manistee (4); Manistique (4); Menominee (4); and Sturgeon (4) Rivers.

The Lake Michigan Tributary Monitoring 10-Year Anniversary Sampling Project was a result of a cooperative effort of the USEPA, Great Lakes Commission, Michigan DEQ, and the US Geological Survey offices in Wisconsin and Michigan. Sampling began in 2005 following ice-out, when rivers become safely navigable for sampling boats and boat landings are free of ice. Sampling will continue for a period of up to one year. Field crews, consisting of teams of USGS personnel, will sample the following tributaries: the Lower Fox River in Wisconsin, the Grand Calumet River in Indiana, and the Kalamazoo, Grand, and St. Joseph Rivers in Michigan.

All water samples from all locations are being analyzed for Hg, trace metals, nutrients and conventionals. Samples from the Grand, Kalamazoo, and St. Joseph Rivers were also analyzed for PCBs. The nutrient/conventional analyses are completed, but have not yet been quality assured. Mercury, trace metal, and PCB analyses were completed in late March 2006.

Plans call for all sampling to be completed by the end of July, 2006 and will be reported in LaMP 2008.

The Lake Michigan Toolbox
Communicating Ecological Indicators

Ecological indicators need to be made more understandable to the public (including decision makers). Methods for articulating environmental values to make the connection between indicators and what the public (individuals) value about the environment should be considered.

Translating the indicators of regional ecological condition used by USEPA into common language for communication with public and decision-making audiences is critical.

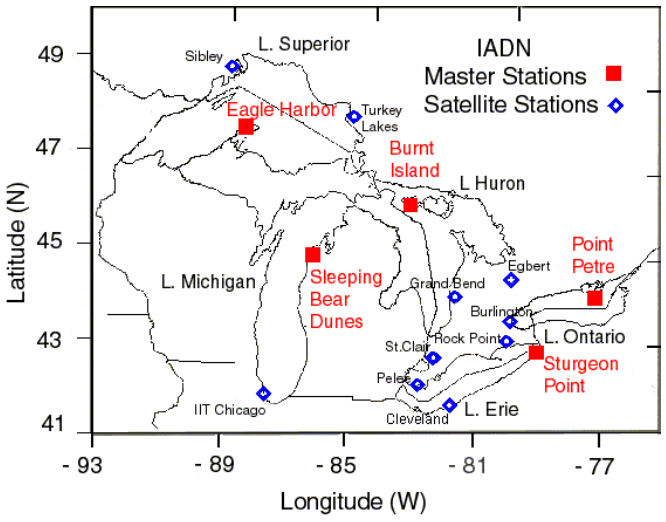
A study by researchers from Clark University, Pacific Southwest Research Station of the USDA Forest Service, University of Tennessee-Knoxville, Oak Ridge National Laboratory, USEPA, and Vanderbilt University revealed that people did not want to know what these indicators measured, or how measurements were performed. Rather, respondents wanted to know what such measurements can tell them about environmental conditions. Most positively received were descriptions of the kinds of information that various *combinations* of indicators provide about broad ecological conditions. Descriptions that respondents found most appealing contained general reference to both the set of indicators from which the information was drawn and aspects of the environment valued by society to which the information could be applied. These findings can assist with future efforts to communicate scientific information to nontechnical audiences, and to represent societal values in ecological programs by improving scientist-public communication.

More information about this issue can be found in a paper titled "Communicating Ecological Indicators to Decision Makers and the Public at: http://sunsite.wits.ac.za/eco/vol5/iss1/art19.

Integrated Atmospheric Deposition Network

The Integrated Atmospheric Deposition Network (IADN) was created under Annex 15 of the Great Lakes Water Quality Agreement in 1990 to determine the magnitude and trends of atmospheric loadings of toxic substances to the Great Lakes. IADN is operated jointly by the USEPA-GLNPO and Environment Canada. Five master stations (1 per Lake) are located in rural areas within one kilometer of the shore to represent background conditions. There are also 10 satellite stations that provide additional detail on levels of toxics in the air around the Lakes. USEPA operates 5 stations: the master stations on Lakes Superior, Michigan, and Erie, as well as two satellite stations in Cleveland and Chicago, which provide useful information about levels of persistent toxic substances in urban air and precipitation. Substances monitored by the network include polychlorinated biphenyls (PCBs), organochlorine pesticides including DDT and chlordane, and polycyclic aromatic hydrocarbons (PAHs). Trace metals such as lead, cadmium, and mercury are monitored at some Canadian sites. Dioxins, furans, and polybrominated diphenyl ethers (PBDEs) are also currently being measured at the U.S. sites.

Air (gas and particle phase) is collected every 12 days in 24-hour samples using high-volume samplers containing an adsorbent, and precipitation is collected in month-long composites. Laboratory analysis protocols generally call for solvent extraction of the organic sampling media with addition of surrogate recovery standards. Extracts are then



IADN Master and Satellite Stations

concentrated followed by column chromatographic cleanup, fractionation, nitrogen blow-down to small volume (about 1 mL) and injection (typically 1 uL) into gas chromatography instruments.

For more information on IADN, see the websites linked from the following page: www.epa.gov/glnpo/monitoring/air2/iadn_info.html.

Next Steps

- Monitoring and research will be reviewed to identify LaMP pollutants and trends to determine if LaMP pollutants list needs to be changed
- A LMMB Study data report completed for each contaminant studied and added to the LaMP online at www.epa.gov/GLNPO/LMMB
- Progress will be made in aligning monitoring programs and indicators
- The coordinated monitoring results for the lake intensive monitoring year 2005 will be completed, analyzed, and published
- Lake Michigan models will be documented further, and additional scenarios will be simulated with results shared through the LaMP and in other ways
- Complete Lake Michigan Monitoring Coordinating Council Aquatic Nuisance Species monitoring survey results and recommendations.
- *Cladophora* alga research and development is being supported by the LaMP

Great Lakes Regional Collaboration Goals and Recommendations Relevant to the Lake Michigan LaMP Subgoal 1

Information and Indicators

Recommendations

1. To provide accurate, complete and consistent information, the Great Lakes region must increase and better coordinate the collection of critical information regarding the Great Lakes ecosystem. The Great Lakes Interagency Task Force and other stakeholders need to implement the U.S. contribution to the Integrated Earth Observation System (IEOS) and the Integrated Ocean Observing System (IOOS) as part of the Global Earth Observing System of Systems (GEOSS). Monitoring must be better coordinated through the existing Great Lakes management entities, both at a lake-wide and region-wide basis.

2. To meet the information and management needs of Great Lakes restoration activities, the Great Lakes Interagency Task Force should promote the continued development and implementation of science-based indicators, including implementation of indicators developed through the SOLEC process.

3. To support Great Lakes restoration activities with appropriate scientific foresight, planning and assurance of results, the overall federal research budget to the Great Lakes should be doubled over the next five years. In addition, adequate funds should be made available to support a Great Lakes Research Office as authorized in the 1987 Clean Water Act Amendments (33 U.S.C. 1268) to coordinate these research efforts. Finally, for all new appropriations in support of Great Lake' restoration activities, at least 10 percent of these funds should be dedicated toward research to aid planning and assessment.

4. To facilitate easy and accessible information exchange among all regional partners, stakeholders and decision makers and to create a consistent and comprehensive repository of Great Lakes data, the Great Lakes Interagency Task Force and all regional partners should augment the regional information management infrastructure (i.e. establish a network of networks), adopt standardized data management protocols and commit to open data availability.

5. To coordinate and manage communication of scientific and technical information, the Great Lakes Interagency Task Force should establish a communications workgroup composed of public affairs specialists from Federal, State, and regional entities and key industries.